

REMARKS

Claims 1-12 are pending in this application. Claims 7-12 have been withdrawn. Claims 1-6 have been rejected.

Claim 6 has been cosmetically amended to clarify the subject matter. No new matter has been added.

A new proposed drawing sheet labeled FIG. 14 is submitted the relevance of which is explained below. No new matter has been added

Claim Rejections – 35 USC 112

The term “low concentration source region” recited in claim 4 has been rejected for not being described in the specification.

Applicants respectfully point out that the specification provides support for the term “low concentration source region” as recited in claim 4. For example, page 15, lines 5-10 of the specification discloses that, in one embodiment, a high concentration source region can be formed in a low concentration source region. This feature is similar to a high concentration drain region being formed in a low concentration drain region as recited in claim 1.

Claim 6 was rejected for not providing antecedent basis for the feature “said high concentration source·drain.” We propose clarifying the feature by replacing the character “.” with the character “/” between the elements “source” and “drain” so that claim 6 recites “source/drain region.” No new matter has been added.

In view of the above amendments and comments, applicants respectfully request withdrawal of the objection.

Drawings

The drawings were objected to for not showing the feature “high concentration source region is formed in said low concentration source region” as recited in claim 4 of the present invention.

Applicants submit a new drawing sheet labeled FIG. 14 showing this feature. No new matter has been added. The specification provides support for this feature. (*See* page 13, lines 5-10 of the current application) New FIG. 14 is similar to FIG. 3 except that the high concentration source region 5 is formed in a low concentration source region 5A.

In view of the above amendments and comments, applicants respectfully request withdrawal of the objection.

Claim Rejections – 35 USC 103

Claims 1 to 6 have been rejected as being obvious over Hsing et al. in view of Kuroi et al. Applicants respectfully disagree for at least the following reasons.

Claim 1 recites a semiconductor device comprising:

- a semiconductor substrate of a first conductive type;
 - a gate insulation film disposed over the semiconductor substrate;
 - a gate electrode provided on the gate insulation film;
 - a high concentration source region of a second conductive type disposed in the semiconductor substrate and at one end of said gate electrode;
 - a low concentration drain region of the second conductive type disposed in the semiconductor substrate and provided to face said source region through a channel region;
 - a high concentration drain region of the second conductive type spaced away from another end of said gate electrode and disposed in said low concentration drain region; and
 - a middle concentration layer of the second conductive type disposed in said low concentration drain region** and disposed at least from a predetermined position spaced away from said gate electrode to said high concentration drain region,
- wherein an impurity concentration of said middle concentration layer increases from near the gate electrode to near said high concentration drain region. (Emphasis added)

The bolded feature of claim 1 is not taught or suggested by the Hsing patent.

Referring to FIG. 2, the Hsing patent shows a transistor structure that includes a substrate 20, a buried layer 23, an epitaxial layer 22, a drift region 31, and a drain region 34. The Office action asserts that layer 22 is equivalent to middle concentration layer, layer 31 is equivalent to low concentration drain region, and layer 22 is disposed in layer 31. However, layer 22 is not

disposed in layer 31, rather, it is the reverse: layer 31 is formed or disposed in layer 22. That is, the structure of the Hsing patent does not teach or suggest the bolded feature of claim 1.

Moreover, the office action goes on to assert that the Hsing patent fails to disclose the "source region disposed in the substrate" as recited in claim 1 of the present application. It further states that the Korui reference discloses a source region disposed in the substrate, and that it would have been obvious to one skilled in the art to combine the teachings of the two references to arrive at the claimed invention.

Applicant respectfully asserts that cited references, alone or in combination, fail to teach or suggest a "source region disposed in the substrate" as recited in claim 1 of the present invention for at least the following reasons. Specifically, attempting to combine the teachings of the Korui patent with the teachings of the Hsing patent would destroy the function/operation of the Hsing patent.

FIG. 2 of the Hsing patent shows a transistor having a multiplayer structure: a substrate 20, a buried layer 23 formed on substrate 20, an epitaxial layer 22 formed on layer 23, a body layer 29, and a source region 32. This multilayer structure is important because it helps overcome some of the problems of a conventional transistor structure such as shown in FIG. 1 and described in the background section of the Hsing patent. For example, layer 23 may help reduce the beta of any parasitic transistor. (See column 3, lines 1-4)

The Office action suggests that it would have been obvious to modify the structure of the Hsing patent to form a "source region disposed in the substrate." Applicant respectfully disagrees. In particular, to modify the Hsing structure would require the removal of the separate layers of the multiplayer structure of the Hsing patent. That is, one skilled in the art would have to remove epitaxial layer 22 and body layer 29 so that the "source region disposed in the substrate" as recited in claim 1 of the present invention. Removal of these layers would impair/destroy the function/purpose of the Hsing patent. For example, removal of the layer 23 would increase any parasitic of a transistor. (See column 3, lines 1-4) Alternatively, having the source region 32 penetrate layers 29, 22, and 23 to reach the substrate 20, would destroy/impair the operation/function of the Hsing patent. Thus, one skilled in the art would not have motivated to combine the teaching of the cited prior art references to arrive at the claimed invention.

Accordingly, claims 1, as well as dependent claims 2-5, are not obvious in view of the prior art references.

Claim 2 should be allowable for at least the same reasons as above. In addition, Claim 2 should be allowable for the following additional reasons. The Office action asserts that FIG. 1 of the Kuroi patent discloses a “middle concentration layer is formed so that the impurity concentration **gradually** increases from said gate electrode to said high concentration drain region” as recited in claim 2. Applicant respectfully disagrees. FIG. 1 of the Kuroi patent shows a region 5 separate from region 6 which indicates that there is an abrupt change in concentration between regions 5 and not a concentration that “gradually increases” as recited in claim 2. Thus, claim 2 is not taught or suggest by the cited reference for these additional reasons

In view of the above comments, applicants respectfully request withdrawal of the rejection.

Summary

In view of the above, applicants respectfully request withdrawal of the rejections and allowance of the application.